Finding Effective Bait for Trapping Small Indian Mongoose in Haiti

An Honors Thesis (HONR 499)

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Abstract

The small Indian mongoose (*Herpestes auropuncatus*) was introduced to Haiti in the late 19th and early 20th centuries (Barun, Hanson, Campbell, & Simberloff, 2011) and quickly became an invasive species that have destroyed the natural ecosystem on this island. Recently there has been speculation that the mongoose is a vector in the rabies endemic within Haiti but no official data had been collected to verify this information. The Center for Disease Control (CDC) decided to collect data by trapping mongoose, drawing blood and testing the blood for rabies antibodies. In order to figure out the most effective bait for capturing mongoose, three different baits were tested; dog food, peanut butter, and fish. However, no mongoose were caught at the first site after three days, the bait and traps were moved to a new location. At the new location, the peanut butter was replaced with fresh coconut. While no mongooses were caught at either site, the general knowledge gained from this study can inform future work with this species.

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The small Indian mongoose (*Herpestes auropuncatus*) was introduced to Haiti in the late 19th and early 20th centuries (Barun, Hanson, Campbell, & Simberloff, 2011) and quickly became an invasive species that have altered the natural ecosystem on this island. Recently there has been speculation that the mongoose is a vector in the rabies endemic within Haiti but no official data had been collected to verify this information. The Center for Disease Control (CDC) is working to collect data by trapping mongoose, drawing blood and testing the blood for rabies antibodies. In order to figure out the most effective bait for capturing mongoose, three different baits were tested; dog food, peanut butter, and fish. However, no mongoose were caught at the first site after three days, the bait and traps were moved to a new location. At the new location, the peanut butter was replaced with fresh coconut. While no mongooses were caught at either site, the general knowledge gained from this study can inform future work with this species.

Introduction

The introduction of the small Indian mongoose (*Herpestes auropuntatus*) as means of biological pest control has long been studied to understand the impact of non-native species on the ecology of the native country. The introduction of mongoose in the Western hemisphere was specifically to reduce the exotic rodent infestation. Mongoose proved to be an excellent predator of rodents and once rodents were greatly reduced they quickly expanded their diet to include native species and became a pest themselves in many locations (Nellis & McManus, 1974). Mongooses were introduced to the country of Haiti during the late 19th and early 20th century (Barun et al., 2011) but as in other locations quickly became an invasive and problematic species. Recently they have become a suspected reservoir and vector of rabies (Tierkel et al., 1952; Pimentel et al., 1984) serving as a direct or indirect source for the majority of this disease seen in canines (Everard & Everard, 1998). In a study in Grenada, wild-caught mongoose were shown to have rabies antibodies ranging from 1.3 to 11.7% (Zieger et al. 2014, Everard et al. 1982) and up to 39.3% for mongoose caught in Puerto Rico (Berentsen et al. 2015).

Haiti is one of the few countries in the Western Hemisphere in which canine rabies is still a serious health concern. Because of the poverty in this third world country, there have few studies conducted to understand how this disease is spread (Wallace et al., 2015). In order to determine whether mongoose are contributing to the rabies endemic in Haiti, we will be trapping mongoose and drawing their blood to test for antibodies.

In order to trap mongoose, effective bait must be used. During a preliminary trapping program in 2015, canned tuna fish was used to bait the mongoose. While some

mongooses were captured with this bait, it is unclear if this is the best bait available. Shredded fresh coconut has been a proven method shown to effectively catch mongoose in Hawaii (Pitt et al., 2015). Mongoose, being carnivores, are also drawn to eating various birds such as chicken, which is often a common ingredient in dog food (Scott, 1892). I plan to test other options that have been suggested to be effective.

Objective

The purpose of this study is to determine the type of bait is the most effective for trapping mongoose in the country of Haiti.

Methods

Study Site

The Republic of Haiti is a beautiful island that lies between the Caribbean Sea and the North Atlantic Ocean. The tropical and semiarid climate varies depending on the altitude but on average the country has a minimum of 23°C to maximum of 31°C with a varied rainfall pattern. The Haitian terrain is mostly rough and mountainous and consists of 75% of the country above 213.36 meters with fertile valleys interspersed between mountain ranges. The land use consists of: 36.28% arable land, 10.16% permanent crops, and 53.56% considered other. There is extensive deforestation causing drastic soil erosion that has changed the natural climate of the island over the years (Geography of Haiti, 2016). There is only 1% of the original forest that remains in Haiti. Haitians do their best to plant crops and work the land. However, the poor soils barely support crops and thus most people have a hard time making a good living (Gibbons, 2010). The lack of trees has led to a much more arid and grassy landscape, which are the perfect living conditions for

mongoose. The first site that this study took place at was a valley in A La Roche in the country of Haiti. This site consisted of jungle terrain with two valleys that form a wide "V" shape **Figure 1 & 2**. The second site that this study took place at was called La Reserve Leogaone. The terrain of this site consisted of desert grassland **Figure 3**.

Figure 1 & Figure 2. A La Roche, Valley where first trapping occurred. The first image represents the primitive farming that is attempted and the second image shows the lush forest terrain

Figure 3. La Reserve Leogaone, location where the second trapping occurred. This picture shows the desert grassland terrain.

Trapping

Dr. Kelly Crowdis is a Veterinary Missionary from America who led the groundwork for this project. Dr. Crowdis organized a team of Haitian Veterinary agents (**Figure 6)** as well as other various Haitian locals to help set up the traps. At the

first trapping site, the traps were set up outlining the "V" shape of the two valleys. We recorded the bait type in each trap for each day. The first valley had 15 traps on the right side and 15 traps on the left side while the second valley had 5 traps on the left side and 15 traps on the right side. The second trapping site was 150 feet to 225 feet with traps approximately 25 feet apart. The distance between traps varied based on the terrain. The traps were set up in a grid formation.

Each trap was tagged and its location recorded with a GPS. Forty-eight Tomahawk live traps (model 202, Tomahawk LiveTrap LLC, Hazelhursts, WI) were baited approximately 25 feet apart. Sixteen of the traps were baited with dried mackerel, sixteen were baited with Chicken based dog food, and sixteen were baited with 100% Peanut Butter (**Figure 4**). Each trap was baited with approximately a little over 1 teaspoon of bait on a white paper plate (**Figure 5**). Each morning the traps were moved one location over in order to minimize bias of the trap location and determine whether it is truly the bait that is attracting the mongoose. Each trap was given a tag that was color coordinated and had a

Figure 4. Examples of the different types of baits that were used in the traps. In order from left to right; fresh coconut, dog food, Haitian peanut butter, and dried mackerel.

label with the bait type and trap number. A random number generator was used to help determine which bait to start with. For the second site, the same overall procedure was

used with some exceptions. The peanut butter was switched over to fresh coconut because it was hard to handle and dried up quickly.

The trapping at the first site began on January 11th 2016, and ended on January 13th 2016. The trapping at the second site began on January 13th 2016 and ended on January 15th 2016. The traps were check twice a day around 8:00 a.m. and 5:00 p.m. Traps were set with fresh bait in the morning and each trap was rotated to a new location. The traps were then checked again in the afternoon but fresh bait was not added unless the bait was missing or had been eaten by ants.

Animal Handling

According to the *Manual for Collection and Sampling of Mongoose in* Haiti, 2016, once a mongoose has been captured, extreme caution must be taken upon approaching and opening the trap. If the mongoose appears to be rabid, extra precaution and euthanasia followed by a necropsy could be a potential alternative for safety reasons. If the animal appears to be healthy, it is placed in a canvas holding bag and an immobilizing agent (Telazol or Ketamine) is administered intramuscularly. The mongoose is completely sedated before removal from the capture bag.

Figure 5. Example of Tomahawk live trap set up with mackerel.

Once the mongoose is completely sedated, the age, sex, and reproductive characteristics of the animal are assessed. Standard measurements taken included total length, tail length, ear length, and length of the right hind foot. Oral and

rectal swabs also were taken. 1 mL of blood was taken from the cranial vena cava. The blood was immediately placed in a serum separator tube and stored in a cooler until it can be spun in a centrifuge. In order to identify recaptures, captured mongoose will receive a spray of horse fly repellent, which leaves a large purple streak down their back. Once finished the mongoose is placed in a safe, shaded area and allowed to recover from the sedation.

Figure 6. Veterinary agents setting up a trap location and baiting the trap in A La Roche.

Results

No mongooses were caught at either trap location. There were a number of traps that were disturbed with either the door closed or the bait missing. A significant number of the traps had ants that had eaten the bait. At the second site we witnessed a lot of dogs disturbing the traps and eating the bait. After three days without success, we decided to move some of the traps to different areas that the local Haitian people had previously seen mongoose before. There was no specific system other than making sure that the same numbers of traps were used of each type of bait. Using this plan, we caught one mongoose at our second trap site but not from the original grid set up. The trap contained two different types of bait, coconut as well as fried fish. Because the trap contained both baits and was in a location that was not present on our grid, we cannot validate the effectiveness of the bait.

Discussion

There are many possible reasons for why no mongooses were caught at either trapping site. The first site consisted of a lot of thick brush and trees. This trapping site was not "typical" mongoose territory. The mongoose tends to prefer dry habitats, such as grasslands as well as secondary growth to dense forest (Roy, 2011). Additionally, the first day we realized that not all of the traps had been set up correctly and that we had potentially been losing a lot of potential animals because they were able to sneak out of the back of the trap. The first day we had a lot of traps that were closed with missing bait so we could have potentially missed some mongoose.

The reason we chose the first site was because of the local Haitians' suggestion. Many of the Haitians who helped out with the experiment had seen mongoose present at this site before. After not catching any mongoose for three days, we decided it was better to discontinue and set up at a different site. We decided to modify from the first site in order to make setting up the traps and the experiment run more smoothly. It appeared that the peanut butter attracted the most amounts of ants and had to be changed the most frequently so we decided to opt out of using it and instead started using coconut. We purchased fresh coconut off of a vendor from the side of the road and split these into pieces that were approximately an eighth of the original coconut. During our first trial we found that sometimes the plates were missing and hypothesized that the animals taking the baits were able to reach their arms through the trap and pull the plate out. In order to avoid this problem and make the plates less accessible, we decided to cut the plates into fourths, saving us plates and preventing the loss of an animal. There was no need to re-label any of the traps and instead just swapped out the peanut butter traps that were pre-labeled with

the coconut. This of course could have led to some bias because the oils from the peanut butter could have potentially seeped through the plates and gotten onto the traps.

The second site looked more promising just from appearances. It consisted of a grassy savannah terrain. While placing the traps three mongoose holes were observed, making us more hopeful that this site would be more successful. The same number of traps was used. During this trapping experience we found that when we came to check on the traps almost all of them were disturbed, moved greatly from their originally marked position, had the door closed, or the bait missing especially in the traps containing dog food and fish. Unfortunately no mongoose was found in any of these traps. It appeared that these traps were disturbed because of the wild dogs. We became concerned that the dogs were disturbing the traps before the mongoose had a time to investigate them. After two days of unsuccessful trapping we decided to move some of the traps to locations where the dogs were unable to reach them. The traps were also moved to locations where the local Haitians had seen mongoose in the mornings.

This trapping experiment, although unsuccessful for our purposes, could be easily duplicated. This same protocol was implemented after I had departed from Haiti with some modifications and they seemed to have success in capturing mongoose. They found that by placing traps in locations where they had seen mongoose previously was more effective than a grid or cluster formation of the traps. They continued to use three different baits and it appeared that they had more success in catching mongoose. Because the traps were not placed at random, it is not possible to determine if success was correlated to bait type. They appeared to have the most success-trapping mongoose within or near the sugar cane or scrub fields. The mongooses do not appear to like the more mountainous areas as much

and there was little success in catching mongoose at those sites. Traps that were set up near people's houses or well marked paths were more likely to be closed with no mongoose inside or moved by dogs or pigs. The ants seem to especially like the coconut making it a poor bait choice. It was more important to trap mongoose in general than to make sure that the set up of the traps were completely randomized and unbiased. The CDC needed to capture as many mongoose as possible in order to test the blood for rabies, therefore they didn't care about how unbiased the traps were as long as they were able to capture mongoose.

During the design phase, a grid system appeared to be the most efficient trapping design. For one of the sites we were able to apply the grid system, however this system still did not work as well as planned. Although the grid efficiently covers the most ground, it does not always cover the spots where the mongoose are most active, such as the brush or places that are not out in the open grassland without any coverage. It appeared that when the local Haitians placed the traps sporadically in places that had significant amount of cover or where they had seen mongoose before the success rate was much better. The next time a study like this is conducted, it would be important to note that although a grid sounds like the best option beforehand while in the field it may not be the most effective system.

Upon talking with some of the local Haitians, it became clear that although mongoose were not always seen they were an incredible nuisance to many of the Haitian farmers animals. One of the farmers said that they will often randomly see mongoose, but it is very rare that they can catch one. The farmers know of the mongooses presence because they will hear them raiding their chicken coops and killing all of their chickens and eating

their eggs. Not many Haitians have seen a mongoose in person. This is due to the elusive and extremely intelligent behavior of mongoose. The Haitian farmers were thrilled when we caught mongoose because it meant that their animals would have a better chance of surviving.

The farmers did not seem to directly link mongoose to rabies. This could be in part because most of the mongoose do not openly bite people. It is well known among Haitians that the primary way to get rabies is through a rabid dog bite. They do not appear to link mongoose with rabies and further research on this topic should be explored. If mongooses are the primary vectors, it is crucial for the Haitian people to be aware of the effects of mongoose and attempt to eliminate them in order to end the rabies endemic on the island of Haiti. Determining what type of bait is most effective is essential in helping trap and test whether the small Indian mongoose are contributing to this tragic endemic.

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